THE

AMERICAN REVIEW OF TUBERCULOSIS ABSTRACTS

VOLUME LI APRIL, 1945 ABST. No. 3

A Pneumonolysis Sponge Carrier.—A simple sponge carrier for intrathoracic work is described. It is rigid enough for use in the enucleation of adhesions. The gauze tape is threaded through an eye and the long end fixed on a prong at the handle. When soiled the gauze is released at the handle and merely pulled through the eye without rethreading. It is made by the American Cystoscope Makers, New York.—*A Pneumonolysis Sponge Carrier and Dissector, J. S. Conant, J. Thoracic Surg., June, 1944, 13: 267.*—*(W. M. G. Jones)*

Hemorrhage from Subclavian Vein during Pneumonolysis.—During closed internal pneumonolysis for an adhesion attached to the apex of the chest above the first rib, the subclavian vein was entered and a large hemorrhage ensued. The only sterile instrument at hand was a scalpel. Iodine was hastily and liberally applied and the chest opened widely in the fourth interspace without benefit of any anesthetic. Only sterile towels were at hand and these were used to stop the hemorrhage by packing them into the apex. Only five minutes elapsed from moment of hemorrhage to its control. The wound was left open and patient returned to his ward. No blood or plasma was available but patient survived following intravenous fluids. Later gauze rolls were substituted for the pack of towels. About 1,200 cc. blood was removed from the chest, which was then closed. Two days later chest was reopened and gauze pack removed. Patient developed an empyema which healed following drainage. Eventual death from spread of disease to good lung occurred five years later.—*Serious Hemorrhage during Closed Internal Pneumonolysis, R. A. S. Cory, J. Thoracic Surg., February, 1944, 13: 32.*—*(W. M. G. Jones)*

Apicolysis with Extrapleural Pneumothorax.—Apicolysis with an extrapleural pneumothorax is being performed in the Sanatorium "Principi di Piemonte" rather frequently and in preference to thoracoplasty because the operative trauma of the former is smaller, there is no resultant deformity and it is assumed that the respiratory function of the collapsed lung may be restored after reëxpansion. Complications are numerous and results dubious in many cases. The author insists, however, that excellent results can be obtained if clinical indications for this operation are strictly adhered to. Apicolysis may be performed in patients whose general condition is worse than would be required before a thoracoplasty, and in the presence of contralateral disease, as long as the latter is not active. The disease on the side to be operated on must be stationary or only slowly progressive and the cardio-respiratory function tests must be satisfactory. Great importance in the problem of the indication is being attached to the site, size and structure of cavities to be collapsed. Thick-walled cavities and those located below the sixth rib must be excluded as well as cavities whose diameter exceeds 4 to 5 cm. It is agreed that many of the cases presented could have been treated equally successfully with a thoracoplasty and that, on the other hand, the apicolysis as advocated

cannot take the place of thoracoplasty in the treatment of pulmonary tuberculosis.—*Alcune considerazioni sulle indicazioni cliniche dell'apicolisi con pnx extrapleurico chirurgico nella terapia della tubercolosi polmonare, A. Omodei-Zorini, Minerva med., 1943, 34: no. 1.—(G. Simmons)*

Extrapleural Pneumothorax.—The operative technique described here is essentially that of Schmidt. The operation is performed under local anesthesia with the patient in a sitting position. About 3 inches of the third rib are taken out posteriorly, following which the parietal pleura is separated from the endothoracic fascia under direct illumination. Since the lung has a tendency to reëxpand, the pneumothorax space must initially be considerably greater than would appear necessary, according to the location of the lesion. Rivanol (150 to 220 cc.) is introduced into the space, for the antiseptic and hemostatic properties ascribed to this substance, and left there for about five minutes. There is always fever following the operation and a small amount of blood accumulates in the space. Refills are being given at four- to five-day intervals for the first two months and at greater intervals later on; the amount of air introduced is about 100 cc.; pressures obtained are as high as +60. Complications are mainly postoperative hemorrhage, suppuration and lung perforations; they are rather frequent. One hundred and twenty cases are presented, divided in two groups. The first group was operated on according to Schmidt's technique, the second according to the author's modified technique and postoperative treatment. In 81 patients sputum conversion was achieved; 18 patients died. Six cases, accompanied by roentgenograms, are described in detail.—*L'apicolisi con pneumotorace extrapleurico, P. Abruzzini, Minerva med., 1943, 34: no. 1.—(G. Simmons)*

Extrapleural Pneumothorax.—A case of an extrapleural pneumothorax was accidentally discovered at autopsy. Air was trapped in a pathological space formed within the parietal pleura on the left. Histological examination disproved the possibility that the outer wall of this pocket may have been formed by fibrin, organized after the absorption of a pleurisy with effusion which had occurred during collapse therapy. Both walls of the pocket proved to be formed by layers of the parietal pleura. Microscopic examination furthermore proved that the tear in the parietal pleura had occurred between the epipleura and mesopleura.—*Un raro caso di pneumotorace extrapleurico, Bottero, Arch. di med. e chir., 1939, no. 5.—(G. Simmons)*

Diaphragmatic Pain in Postoperative Hemorrhage.—Six out of 53 cases of apicolysis with institution of an extrapleural pneumothorax developed severe postoperative hemorrhage six to twenty-four hours after the operation and one patient died of this complication. This complication is always accompanied by a severe pain over the operated side and is preceded by the pain, which must be considered an important signal of alarm.—*Sul dolore diaframmatico, segno di alarme nella emorragia post-operatoria da pnx. extrapleurico chirurgico, P. Abruzzini, Lotta contro la tuberc., 1940, 11: no. 12.—(G. Simmons)*

Phrenic Paralysis.—The indications for phrenic paralysis are still ill defined. As an ancillary form of collapse in partial pneumothorax its value is well established, but it is seldom used as a first-line treatment, and by few in early cases. In an attempt to assess its value in early cases, 265 consecutive operations have been reviewed and the results of operation in 145 early cases have been classified. The following were the indications for operation for the entire group: (*1*) for the control of hemoptysis — 3 cases; (*2*) for the relief of pain — 4 cases; (*3*) for the consolidation of improvement already gained by sanatorium treatment — 18 cases; (*4*) as a palliative treatment in advanced disease — 30 cases; (*5*) as an ancillary treatment to pneumothorax — 64 cases; (*6*) in "suitable" early lesions when it was either the treatment of choice or followed the failure to induce

pneumothorax — 145 cases. The final classification was made on discharge from sanatorium, and a "successful" result was one in which the sputum was negative, the cavity, if previously visible, could not be demonstrated, and the area of infiltration was reduced and had the appearance of healing disease. The results of 145 consecutive operations for phrenic paralysis as a primary treatment in early lesions revealed successful results in 58 per cent of cases in which less than half of one lung was involved and in which the cavity did not exceed 1½ inches in diameter. The author advocates temporary phrenic paralysis as a primary treatment in early lesions of limited extent, and it can be made permanent if necessary.—*Phrenic Paralysis: Its Place and Value in the Treatment of Tuberculosis, F. L. Wollaston, Tubercle, July, 1943, 24: 121.*—(*E. H. Rubin*)

Phrenic Paralysis.—The value of alcohol injections into the phrenic nerve as a means of producing paralysis lasting (three months to three years) in those cases in which a temporary result only is desired is stressed. Twenty cases were thus injected out of a total of 1,000 operations for phrenic paralysis and the results were satisfactory.—*Per una estensione delle indicazioni della paralisi diaframmatica, A. Bruscia, Riv. di tisiol., 1940, 13: 150.*—(*G. Simmons*)

Pneumoperitoneum.—The main indications for pneumoperitoneum are: (*1*) bilateral tuberculosis in which pneumothorax and phrenic paralysis have been unsuccessful or not feasible; (*2*) uncontrolled hemorrhage; (*3*) additional treatment after abandonment of pneumothorax; (*4*) supplementary therapy to phrenic paralysis. The changes produced by pneumoperitoneum consist of lymph stasis and subsequent fibrosis, pulmonary anoxemia, reduction in chest capacity, relaxation of tissues and diminution of toxic signs and symptoms. Among the advantages of this method of treatment are its reversibility and the fact that the reduction in vital capacity occurs but gradually. Complications (air embolism, ascites, mediastinal emphysema, etc.) and contraindications (fixed diaphragm on the diseased side, coronary and generalized arteriosclerosis, amyloidosis, etc.) of pneumoperitoneum are then enumerated and the authors' technique described. At autopsy inflammatory changes of the peritoneum have been observed in only 10 per cent of cases. Electrocardiographic changes during pneumoperitoneum consist of shift of the electrical axis to the left in the absence of diaphragmatic paralysis, and shift to the right or to the left in the presence of right or left phrenic paralysis, respectively. The case of a twenty-six year old female, with a subclavicular cavity on the left and infiltrations in the right upper lobe is described. After left pneumothorax and left phrenic crush had been unsuccessful, pneumoperitoneum was induced and maintained for two years, with resulting closure of the cavity and sputum conversion. Pneumoperitoneum can be used to good advantage in selected cases.—*Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis, B. M. Stuart, R. L. Pullen & J. L. Wilson, New Orleans M. & S. J., August, 1944, 97: 61.*—(*P. Lowy*)

Pneumoperitoneum.—The aim of the article is to show that pneumoperitoneum has a place in the collapse therapy of pulmonary tuberculosis. What this place is has not been sufficiently defined. The treatment cannot be regarded as a substitute for other forms of collapse therapy but rather as an additional measure likely to prove valuable in particular cases. Pneumoperitoneum is essentially an interim measure directed specifically to achieving cavity closure, usually in association with other forms of collapse therapy, especially phrenic crush and artificial pneumothorax. As to the length of time a pneumoperitoneum should be maintained, the general rule appears to be that it is a matter of months only, although there are exceptions. The best results are obtained when disease affects mainly the lower zones. The major complications are perforation of the bowel, air embolism, intraperitoneal effusion, accidental pneumothorax,

mediastinal emphysema and cardiac decompensation. Details of 10 illustrative cases are given.—*Pneumoperitoneum in the Collapse Therapy of Pulmonary Tuberculosis, E. Clifford-Jones & N. Macdonald, Tubercle, June, 1943, 24: 97.*—(*E. H. Rubin*)

Thoracoplasty through Small Muscle-splitting Incisions.—At the Philadelphia General Hospital the author has revived an old operation first described by Head, 1928; and again by Head and by Wangensteen in 1938. Instead of using the conventional scapula-mobilizing hockey-stick incision, this procedure employs four to six small muscle-splitting incisions, three of these posterior and three anterior. Through each incision long segments of two to three ribs can be resected with ease. The authors, however, employ special long periosteal rib strippers, which can be used to advantage where the exposure is limited. An apicolysis may be done if desired through the upper posterior incision. As each stage is small, shock is minimal or absent; indeed the author claims the patient is often "able to feed and bathe himself the day following operation and on the second day may even walk to the bathroom." The economy in nursing care is therefore great. Functional and cosmetic results are also better than with the conventional incision. At first the operation was used only for the very sick or mixed infection empyemata, but is now used routinely for all cases. Both the medical staff and the patients appreciate the smaller operation and take it more willingly.—*Muscle-Splitting Thoracoplasty, R. M. Lewis, J. Thoracic Surg., October, 1944, 13: 431.*—(*W. M. G. Jones*)

New Treatment of Residual Cavities.—Here is a new treatment for an old problem, the residual cavity after thoracoplasty. That this procedure is effective is shown by the report that 22 of 23 cases so treated now have complete sputum conversion. There were no deaths and no serious complications. The claim is made that the lung mobilization does not increase surgical shock and very greatly lessens the paradoxical motion of the chest wall so common after extensive revisions. The author discusses the essential principles to be followed to give satisfactory collapse of the lung in the first series of thoracoplasty operations, namely: (*1*) the resection of transverse spinal processes and sufficient lengths of the necessary number of ribs; long anterior rib segments are not permitted; (*2*) the application of 10 per cent formalin to periosteal rib beds, especially the upper three; (*3*) elimination of undue delays between stages; the optimum interval is three weeks; (*4*) maintenance of an adequate period, seven months or more, of strict bed-rest following completion of the surgical program. The Semb procedure of apicolysis has advantages, especially for large upper lobe cavities, but the dangers of this mediastinal dissection (chiefly infection) seem to outweigh the advantages, and it has been abandoned. Despite all these measures and precautions, certain cases continue to have persistent cavity and positive sputum. During the past three years (1941–1944) these authors have had 203 cases come to thoracoplasty; and another 39 have had to have revision operations for residual cavities. Of these 39, 23 have had "mobilization and fixation" as described herein. The various methods of treating these residual cavities are discussed, but none of them have given satisfactory results to secure general adoption. The list of these is quite large: apicolysis (Semb and Overholt), myoplastic thoracoplasty (Head), pneumonectomy or lobectomy (Dolley and Jones, Alexander), pedicled muscle flaps (Coryllos and Ornstein), extrapleural gauze packs, intracavitary drainage (Monaldi), flap drainage (Rogers). The method proposed here sacrifices as little lung tissue as possible, has few complications, and gives a smooth convalescence along with a high percentage of cavity closure. The procedure is as follows: Following the usual revision operation the lung is mobilized posteriorly by incising scar tissue along the spine and, by blunt dissection, the lung is freed and elevated out of the posterior vertebral gutter and from the lateral aspects of the vertebral bodies. The

intercostal bundles are dissected forward and their posterior portions freed as far as necessary (by dividing external intercostal muscles only the intercostal structures as a whole are carried along with the lung). Blood supply to the lung is thus maintained. On the anterior aspect of the vertebral bodies care must be exercised to preserve the sympathetic trunk, thoracic duct, etc., but these structures need not be exposed. The dissection is carried upward to the second dorsal vertebra and downward to the vertebral body of the last rib resected. (The authors have not carried this dissection below the eighth rib.) The lung thus mobilized is then rolled forward and sutured in position with black silk and No. 2 chromic catgut doubled. The sutures are passed through the dense fibrous tissue overlying the lung mass posteriorly and through the similar fibrous mass anteriorly or through the cartilagenous chondrosternal portion of the resected ribs. The wound is closed in layers without drainage. This operation should not be performed at the time of the primary thoracoplasty because of the absence of scar tissue suitable for suturing. Moreover it cannot be used in empyemal cases. Postoperatively as soon as tolerated, sandbags, shotbags and wedge pillows are used. One case required aspiration of fluid by needle. There were no infections. The author recommends this procedure for routine use with any revision thoracoplasty to close a residual cavity.—*Surgical Management of Residual Tuberculous Cavities following Primary Thoracoplasty, A. R. Judd, J. Thoracic Surg., June, 1944, 13: 249.*—(*W. M. G. Jones*)

Thoracoplasty Results.—The clinical material that forms the object of this review includes cases with good, fair and poor indications. The indication in this latter group seemed to be justified in spite of the unfavorable circumstances by a certain percentage of success in a group of cases otherwise doomed. The operation was always preceded by a complete study of the patient, including laboratory investigations, complete X-ray studies and bronchoscopy. Local infiltration anesthesia with 0.5 per cent novocaine was used with or without epinephrine; in some cases Evipan was used to complement the anesthesia. In the five years previous to this publication, 8,000 patients were admitted, 457 (5.7 per cent) of whom were considered for thoracoplasty. The indication was accepted and the operation performed in only 200 cases. Twenty-nine cases presented good indication (14.5 per cent), 48 cases fair and 123 poor indication, (24 per cent and 62.5 per cent, respectively). The percentage of mortality was as follows: 10 per cent in the first group, 33.3 per cent in the second and 35.7 per cent in the third group. One hundred and thirteen of the operated patients were males and 87 females. The great majority of the patients belonged to the age groups between twenty and thirty-four years. The oldest patient operated on was fifty-nine years old. In the age groups above forty years a marked rise in the mortality rate was observed. The operation was performed more frequently on the right side. Short intervals between the stages of the operation proved to be advantageous; longer intervals were motivated by various causes, such as infection of the wound in over 50 per cent of the cases. The frequent occurrence of wound infection is explained by the poor general status of the patient, by pleural suppurations affecting the peripleural tissues, by the infection of an extrapleural hematoma and by exogenous infection. The local use of sulfanilamide may reduce the incidence of wound infection. Ninety per cent of the patients had far advanced lesions; only 10 per cent had moderately advanced lesions; all of them showed evidence of cavitation. Thirty-eight cases (19 per cent) were apparently cured by the intervention; in 43 cases (21.5 per cent) the thoracoplasty was followed by improvement; in 56 cases there was no improvement and 63 patients were dead at the time of this publication. In the evaluation of these poor results, the authors emphasize that they were led in their indications more by the purpose of saving human lives than by their desire to publish brilliant statistics. The presence of pneumothorax

either on the operated side or on the opposite side has impaired their results. Poor therapeutic effects were obtained also in cases with giant cavities, that is, cavities having a diameter of over 4 cm. Fibrous lesions in the opposite lung were the least affected by the thoracoplasty, while fibro-ulcerative and exudative processes in the contralateral lung had an unfavorable effect on the results. Tuberculous empyemata associated with parenchymatous lesions and those with mixed infection, especially if operated at a late stage of the disease, gave a high mortality rate. The conversion of the sputum occurred in 69 cases out of 137 who were alive at the time of this communication. The persistence of positive sputum in patients with apparently good collapse of the diseased area is explained by the presence of tracheobronchial lesions.—*Revision estadistica y estudio clinico de 200 casos de toracoplastia operados en el Hospital-Sanatorio "La Esperanza," C. V. Figueral, L. C. Lopez, J. D. Garteiz & M. B. Bravo, Rev. de tuberc. (Habana), January–March, 1944, 1: 29.*—(*L. Molnar*)

Late Results of Thoracoplasty.—This study gives a 100 per cent follow-up of 232 cases of thoracoplasty for the ten years, 1931 to 1941, at the Koch Hospital (St. Louis Municipal Sanatorium). About one-third of the patients were Negro. Ineffective pneumothorax was abandoned in 90.5 per cent, and hence only 6 per cent (13 cases) had empyema. Tracheobronchial disease was first treated bronchoscopically. There were bilateral cavities in only 8.4 per cent (19 cases), and in these the disease on the good side was controlled by pneumothorax, phrenic crush or pneumoperitoneum. Eighty-two patients had phrenic crush. The cases are presented in three groups of about equal size, each representing different surgical techniques and criteria for the years 1931–1935, 1936–1938, 1939–1941. The improvement in these factors is reflected in the reduced number of revisions necessary (6 and 2 in the latter periods as compared to 42 in the former); in the lowered over-all six-year mortality (24.5 and 20.2 per cent as compared with 35.8 per cent); the improvement in over-all favorable results (74.0 and 78.7 per cent as compared to 49.7 per cent for the older group); and the reduction in hospital stay (3.0 and 2.3 years instead of 4.7 years). The one-year operative mortality for the whole 232 cases was only 4.7 per cent.—*Thoracoplasty for Tuberculosis, A. R. Valle, J. Thoracic Surg., February, 1944, 13: 36.*—(*W. M. G. Jones*)

Physical Findings after Thoracoplasty.—For the diagnosis of residual cavities after thoracoplasty, overexposed films and tomograms are extremely valuable. The author has correlated the physical and radiographic findings in 11 operated cases. Tuberculous infiltrations cannot, as a rule, be recognized on physical examination following thoracoplasty, but cavities of moderate and large size can be picked up with the stethoscope. On percussion, moderate to marked dulness is the rule, depending on the type of operation performed. Areas of tympany are discovered to lie over relaxed normal lung tissue. These areas are frequently found beneath the clavicle. Tympany is rarely obtained over a cavity. On auscultation a great many adventitious sounds are heard and it is advantageous to examine the patient while he is breathing quietly. This minimizes the number of râles due to mechanical compression and kinking of the bronchi. With quiet respiration, resonating râles are due to cavity formation. Physical examination is, of course, not advocated in place of X-ray films and tomograms to determine residual cavities, but as a guide to such procedures to avoid excessive cost of X-ray examinations. Before each case is finally evaluated and treatment decided upon, sputum examinations and a thorough check-up of the other side are in order.—*Klinischer und radiographischer Befund bei Thorakoplastik, R. Banderet, Schweiz. med. Wchnschr., March 25, 1944, 74: 310.*—(*H. Marcus*)

Wound Infection in Thoracoplasty.—At the Robert Koch Hospital there were 339 thoraco-

plasties performed in two and one-half years prior to July, 1942. Of these, 11.8 per cent showed infection of the operative wound. Drainage of the wound was employed 52 times. The causes of wound infection were investigated and a second series of 120 operations was carried out without a single infection of any kind. None of this series was drained. The precautionary measures are discussed as follows: (*1*) the elimination of contamination from skin and air, (*2*) the operative technique, (*3*) the postoperative care of the wound and (*4*) the general treatment of the patient. The routine procedure is as follows: The skin is scrubbed repeatedly with soap and water, starting several days before the operation. In the operating room the skin is treated with ether, 3.5 per cent tincture iodine and then alcohol. After the incision is made the skin is covered with thick absorbent pads (to absorb blood or perspiration) under the usual sterile towels applied to the edges of the skin. The skin is treated with alcohol again before the skin is sutured. During the operation only the working area is allowed to be uncovered. Before closure the wound is thoroughly irrigated with saline solution. In the operative procedure there is gentleness and careful debridement of all loose soft tissue. Closure is effected with the smallest suture material, 0 chromic for the muscles, 000 chromic for fascia and A silk for the skin. Few bleeding vessels are tied, but all bleeding spots are included in the interrupted muscle suture. (Sanguinous fluid had to be aspirated 6 times.) Postoperatively a pressure dressing is used, employing mechanics "waste." Hematomata are aspirated only. Finally, to ensure rapid healing of the wound, a high protein diet with additional vitamins is used, both before and after surgery. Every case had a blood transfusion.—*The Problem of Wound Infection in Thoracoplasty, Y. K. Wu & M. B. Planetto, J. Thoracic Surg., October, 1943, 12: 648.—(W. M. G. Jones)*

Wound Infection in Thoracoplasty.—Two series of thoracoplasty operations are presented to show the beneficial effect of dusting 5 g. of sulfathiazole into the wound before closure. In the first series there were 90 operations with 69 per cent primary healing, 17 per cent of superficial sepsis and 5 per cent of deep sepsis. In the second series, performed under more or less identical conditions, the use of the sulfathiazole in 90 stages gave 93 per cent of primary healing and no cases of superficial or deep sepsis. Most patients were colored Jamaicans. The wound was not washed with saline. Formalin was used routinely for the periosteum. Toxic effects of the drug were not seen in any case.—*Wound Healing after Thoracoplasty in a Tropical Hospital, R. A. S. Cory, J. Thoracic Surg., October, 1943, 12: 653.—(W. M. G. Jones)*

Cavity Drainage.—From experiences collected to date, the place of cavity drainage in the treatment of tuberculosis can be more or less exactly defined. After pneumothorax therapy has been unsuccessful in certain cases, the chances for a success of endocavitary drainage are good. Such cases are large cavities which show no tendency to collapse in spite of a technically good pneumothorax, frank tension cavities, lower lobe cavities or upper lobe cavities suspended by uncuttable adhesions. Cavity drainage has also widened the indications for phrenic crush. A combination of these two procedures is especially useful in cavities of the middle and lower lung fields, cavities in the apex of the lower lobe, centrally located cavities (if the proximity to large blood vessels can be excluded) and in upper lobe cavities when for some reason thoracoplasty is not under consideration. The procedure is also advocated in combination with thoracoplasty, especially when multiple cavities are present, or if the cavity is larger than one can expect to close by thoracoplasty. Also, in patients in poor general condition, preoperative cavity drainage helps to improve the patients' status so that they can be operated on at a later date. The procedure also has a place in the treatment of residual cavities after thoracoplasty. In the latter type of case it carries practically no risk. The results of cavity drainage are better

in unilateral disease than in bilateral and in this respect it does not differ from the usual methods of collapse therapy.—*Kavernensaugdrainage und kollapstherapeutische Indikation bei Lungentuberkulose, St. J. Leitner, Schweiz. med. Wchnschr., April 8, 1944, 74: 369.—(H. Marcus)*

Physiological Approach to Pulmonary Resection.—The newer operative techniques no longer make it necessary to sacrifice a whole lobe or lung in performing resection of pulmonary tissue. New advances in anesthesia and the technique of individual ligation allow more time at the operation and result in many fewer cases of putrid empyema. A new physiological concept is presented—that of considering the surgical units of the lungs as the bronchopulmonary segments, rather than the better defined lobes. Thus, there are eight surgical lobes, each with its own bronchus, arterial and nervous channels accessible for individual ligation. These are the two upper, two middle (the lingula is comparable in every respect to the right middle lobe), and four lower lobes (each anatomical lower lobe is divisible surgically into a dorsal division and a basal division). These are well defined and constant and pathologically as well as surgically are of practical importance. For example, the dorsal divisions of the lower lobes are the most frequent site of abscess, but rarely the site of bronchiectasis which predominates in the basal segments. The upper lobes and the basal divisions of the lower lobes are each further divisible into four segments. The lingula and right middle lobe are likewise further divided into two segments each. Segmental pneumonectomy of any of these divisions is practicable and safe—except of the right middle lobe, where the two segments are indistinct and very little lung tissue would be saved anyway. Thus in many cases of bronchiectasis partial lobectomy would afford conservation of lung tissue hitherto not attainable. In peripheral tumors, likewise, segmental resection is often done until microscopic studies are completed, before the more radical pneumonectomy is performed. In the author's 8 cases, there were no deaths and only one postoperative empyema. Accurate localization of the diseased segments and careful operative technique are stressed.—*Conservation of Lung Tissue by Partial Lobectomy, B. Blades, Ann. Surg., September, 1943, 118: 353.—(D. J. Rednor)*

Pneumonectomy for Pulmonary Tuberculosis.—From 1880 to 1942, 34 cases of lobectomy and 30 of pneumonectomy for tuberculosis are culled from the literature. Of these, 31 are known to be living and 29 reported dead. While indications for excision of lung tissue for tuberculosis have varied, the concensus is that bronchial stenosis is the strongest indication for operation. Blocked cavities and the failure of collapse therapy are also indications. Bronchial lesions should be quiescent, and the good contralateral lung absolutely free from disease. The case reported here was a nurse, age forty-five, who had left bronchial stenosis 2 cm. from the carina, atelectasis of the base and cavities in the upper lobe. Her vital capacity was 75 per cent of normal. Pneumonectomy was by hilar dissection method. Adhesions separated readily. The patient had absolutely no reaction to the operation and was in good health eighteen months later.—*Total Pneumonectomy for Pulmonary Tuberculosis, M. Behrend, J. Thoracic Surg., June, 1943, 12: 484.—(W. M. G. Jones)*

Arterial Oxygen Saturation after Pulmonary Resection.—Several hundred determinations of the arterial oxygen saturation in the postoperative period were made by the method of VanSlyke and Neill. The normal range is given at 94 to 96 per cent and as low as 92 per cent in older patients. Less than 90 per cent saturation is considered significant, and less than 85 per cent is considered as severe anoxia. Seventeen patients were studied following pneumonectomy—the majority had only slight reduction for the first week; in 2 cases there was prolonged unsaturation, associated with mediastinal deviation. Twenty-one cases were presented following

lobectomy. The return to a normal oxygen saturation level was slower than in the uncomplicated pneumonectomy cases. Most cases showed some anoxia in the first week. In most of the cases with abnormally low saturation for more than a week postoperatively, some interference with pulmonary ventilation was present—such as difficulty with reëxpansion of a lobe, pleural fluid, atelectasis and pneumonic infiltration due to retention of bronchial secretions, diminished respiratory excursion, mediastinal displacement, emphysema and fibrosis, bronchial fistula. Five cases were presented following exploratory operations—all showed slight reduction varying from 89.5 to 93 per cent. Twenty-seven patients following thoracoplasty were investigated. A slight reduction was observed even in some good-risk patients without complications, and the majority showed an appreciable drop. As a control, 13 patients were studied following major abdominal surgery—no instance of anoxic anoxia was found. The authors emphasize that it is customary to administer oxygen for only a few days following operation unless cyanosis or dyspnea is present. Their studies show that a significant degree of anoxic anoxia persisted for weeks without dyspnea or cyanosis, and marked clinical benefit was derived when oxygen therapy was again instituted. Symptoms which suggest subclinical anoxia are headaches, restlessness and mental confusion. They believe unrecognized anoxia is common in thoracic surgery and prefer to make routine determinations of the arterial oxygen saturation so that anoxia will be detected in its earliest stages. They stress the greater unsaturation following lobectomy as compared with pneumonectomy and the increase in unsaturation following both procedures when complications are present. In the latter instance especially, prolonged oxygen therapy is recommended.—*Studies of the Arterial Oxygen Saturation in the Postoperative Period after Pulmonary Resection, H. C. Maier & A. Cournand, Surgery, February, 1943, 13: 199.*—(*D. J. Rednor*)

Mediastinal Displacement following Pneumonectomy.—Any displacement of the mediastinum, however slight, following total pneumonectomy can upset the cardiopulmonary function and result in grave consequences, if not corrected. Displacement toward, or away from, the operated side is of equal importance. The chief causes of displacement toward the contralateral side are (*1*) pleural fluid, (*2*) pneumothorax (especially tension type) and (*3*) atelectasis of the contratateral lung due to retained bronchial secrelions. The causative factor if displacement toward the operated side is loss of pleural air by (*1*) subcutaneous emphysema, as in the anterior surgical approach where good closure of the intercostal muscles cannot be obtained or by (*2*) closed drainage of the water-seal type for infection, which results in an increasingly negative intrapleural pressure. The position of the mediastinum is best determined by serial postoperative X-ray films and intrapleural manometric readings. Increased pressure with displacement away from the operated side is treated by air or fluid aspirations or both, as necessary. Prevention and treatment of atelectasis of the contralateral lung must also be done. Decreased intrapleural pressure is best treated by giving small pneumothorax refills. The optimum final pressures should be neutral or slightly subatmospheric. A change in the position of the mediastinum can also occur without the mechanical alterations described above. For example, a shift toward the side operated on may occur, due to emphysema and hyperinflation of the remaining lung or due merely to the high negative pressure in the pleural space from which the lung was removed. Likewise, certain factors at operation can influence the position of the mediastinum in the opposite direction: namely, the lateral position of the patient on the operating table, a high amplitude of respiratory excursion when the thorax is being closed, and the sucking-wound action of the incision when it is almost closed, resulting in the tension-type pneumothorax. The importance of minimizing the degree of mediastinal displacement, from whatever cause, in the early

postoperative period, especially in the elderly and poor-risk group of patients is stressed. Pressure readings at the conclusion of the operation and at intervals thereafter, and roentgenograms on the first or second postoperative day and then at intervals of a few days are the surest diagnostic methods, if instances of cardiac irregularity and cardiopulmonary failure are to be successfully overcome.—*Cardiopulmonary Disturbances Associated with Mediastinal Displacement after Pneumonectomy, H. C. Maier, Surgery, March, 1944, 15: 432.*—(*D. J. Rednor*)

Hypoproteinemia following Thoracic Surgery.—Studies of the plasma protein level were done before and after 32 major chest operations on 29 patients. In 31 of these a drop was seen. The average decrease was 1.11 g. per cent in 14 lobectomies, 0.95 g. per cent in 5 pneumonectomies, in all cases about 1.0 g. per cent. The fall usually occurred from three to five days following operation and was accompanied by a similar decrease in hematocrit, hemoglobin and red blood cells. The principal causes of the drop in plasma protein were: (*a*) diminished protein reserve, (*b*) operative blood loss, (*c*) loss of blood and plasma into the wound and pleural space after operation, (*d*) infection, (*e*) inadequate replacement. Massive transfusion of whole blood was the most satisfactory single therapeutic agent when the plasma proteins were lowered due to hemorrhage.—*Hypoproteinemia in Thoracic Surgery: A Clinical Study, T. F. Thornton, W. E. Adams & P. W. Schafer, Surg., Gynec. & Obst., October, 1944, 79: 368.*—(*G. C. Leiner*)

Electric Charge of Bacteria.—The filtrability of bacteria is determined by their electric charge, as was indicated in a previous paper by the author. The R type is predominant in the culture of tubercle bacilli and since it is, supposedly, charged positively, it would be retained by the filtre having a negative electric charge. The filtrable portion of a culture would have a different electric charge. Recent experimental studies have demonstrated that the phenomena observed after the inoculation of S type of tubercle bacillus cultures are identical with those produced by the "ultravirus." It is more proper, therefore, to speak of filtrable forms of tubercle bacilli than of ultravirus. Experiments with cultures of *Pseudomonas aeruginosa* have confirmed this observation. The different electric charges would correspond to different morphological characteristics. The normal cultures contain germs of opposite electric charge, while the R and S types of cultures would represent different phases of dissociation of the culture.—*La carga electrica de las bacterias, factor determinante de su filtrabilidad y de la morfologia de las colonias, R. C. Reig, Publ. d. Inst. Antituberc. "Francisco Moragas," Barcelona, 1943, 5: 83.*—(*L. Molnar*)

Bacteriostatic Chemicals for Tubercle Bacillus.—The bacteriostatic effect of various chemotherapeutic and chemical substances, such as promanide, sulphanilamide, sulphathiazole, sulphadiazine, cetavlon, phemeride and potassium tellurite, on the growth of tubercle bacilli was determined. The author used the slide method described by Pryce where tubercle bacilli are grown on microslide preparations of sputum. The slide preparations were placed in medium containing the substance under investigation and incubated at 37°C. for seven days. The routine medium was made by mixing one part human citrated blood with two parts sterile distilled water. To this medium varying concentrations of the chemotherapeutic and chemical substance were added. Of the sulphonamide drugs tested the author found very little effect with sulphanilamide while sulphathiazole showed good bacteriostasis in a concentration of 5 mg. per 100 cc. Promanide produces very slight inhibition of growth. The kationic detergents, cetavlon and phemeride, produced complete bacteriostasis in concentrations of 40 and 20 mg. per 100 cc., respectively. Potassium tellurite gave complete bacteriostasis in concentrations of 10 mg. per 100 cc.—*On the Use of a Modification of Pryce's Slide*

Culture Method for the Estimation of the Bacteriostatic Power of Chemicals on the Tubercle Bacillus, H. Muller, J. Path. & Bact., July, 1944, 56: 429.—(H. J. Henderson)

Lytic Action of *Bacillus subtilis* on Tubercle Bacilli.—A motile, sporulated and gram-positive germ of atmospheric origin is described which was found as an accidental contaminant in cultures of the tubercle bacillus. Observation disclosed a lytic action on tubercle bacilli and also on the Souza Araujo strain of the leprosy bacillus. An effort is being made to extract by various processes the active bacteriostatic substances. Among those so far investigated, only the one called crude subtiline has shown, both *in vitro* and *in vivo*, a bacteriolytic and antagonistic effect on the tubercle bacillus. Subtiline has not shown any toxic effect when administered in therapeutic doses to guinea pigs or rabbits.—*Lytic Action of Bacillus subtilis on Mycobacterium tuberculosis, M. F. Magarao, A. Arriagada-V. & S. Thales, Rev. brasil. de med., July, 1944, p. 556.—(A. A. Moll)*

Growth of Tubercle Bacilli on Hyperglycemic Blood.—Basing his experiments upon the work of other authors who found that addition of blood to a culture medium is favorable for the growth of tubercle bacilli, the author confirms this opinion and states that hyperglycemic blood is more favorable than normal blood. Since, however, there is no difference in promotion of growth between normal blood and blood to which glucose had been added, it is concluded that diabetic blood may contain another factor, favorable for the promotion of growth of tubercle bacilli.—*Sul potere favorente lo sviluppo dei batteri del sangue iperglicemico dei diabetici e dei diabetici tubercolari, V. Agnello, Riv. di tisiol., 1940, 13: 361.—(G. Simmons)*

Filtrability of Tubercle Bacilli.—The author investigated the possibility of the existence of a form of *M. tuberculosis* capable of passing through gradocol membranes of known porosity size. Saline suspensions of *M. stercusis* and the human and bovine types of *M. tuberculosis* were filtered through a series of collodion membranes of decreasing pore size. The presence or absence of viable elements in the filtrates was determined by cultural or biological methods. The methods employed were unable to detect viable elements in filtrates drawn through membranes of A.P.D. 0.7 U.—*The Filtration of Mycobacterium Tuberculosis and Mycobacterium Stercusis through Gradocol Membranes, M. A. Soltys & A. W. Taylor, J. Path. & Bact., April, 1944, 56: 173.—(H. J. Henderson)*

Tuberculostearic Acid.—By means of X-ray diffraction studies of tuberculostearamide and of dl-10-methyl-stearamide, the conclusion was reached that the differences observed were consistent with the hypothesis that tuberculostearic acid, although showing no detectable optical rotation, is optically active. Stearic acid and tuberculostearamide molecules had similar orientations in the crystal. The results support the structure of d- or l-10-methylstearic acid proposed for tuberculostearic acid.—*Chemistry of the Lipids of Tuberculostearic Acid, S. F. Velick, J. Biol. Chem., July, 1944, 154: 497.—(F. B. Seibert)*

Lipids of Tubercle Bacilli.—Total lipids of the bacilli (strain H37), cultivated on a modified Long synthetic medium in which dextrose replaced glycerol, amounted to 30.6 per cent, comparable to that found on the unmodified medium. The lipids contained no phosphatide and only an acetone-soluble fat and a low melting wax. The acetone-soluble fat on analysis was similar in composition to the fat elaborated on a glycerol-containing medium. It contained tuberculostearic acid, phthioic acid, the pigment phthiocol, no glycerol but a carbohydrate which could not be definitely identified. The wax fraction differed from the waxes isolated from the tubercle bacillus cultivated on a glycerol-containing medium in that no high melting wax could be found. The low melting wax, however, gave on analysis certain of the characteristic components of the tubercle bacillus wax, namely, mycolic

acid, the alcohol phthiocerol, dextro-rotatory fatty acids analogous to phthioic acid, and a polysaccharide that contained pentose.—*The Chemistry of the Lipids of Tubercle Bacilli. LXVII. The Lipids of the Human Tubercle Bacillus H-37 Cultivated on a Dextrose-containing Medium, M. M. Creighton, L. H. Chang & R. J. Anderson, J. Biol. Chem., August, 1944, 154: 569.*—(*F. B. Seibert*)

Lipids from Cell Residues from the Preparation of Tuberculin.—The lipids contained in tubercle bacilli residues from the preparation of PPD were extracted and separated into phosphatide, low melting wax, acetone-soluble fat, chloroform-soluble wax, and firmly bound lipids. In solubility these lipids resemble analogous fractions previously isolated from tubercle bacilli, strain H37, but certain differences in chemical composition were observed, which must be due to the strain of bacillus used.—*The Chemistry of the Lipids of Tubercle Bacilli. LXVIII. The Lipids of Cell Residues from the Preparation of Tuberculin, M. M. Creighton & R. J. Anderson, J. Biol. Chem., August, 1944, 154: 581.*—(*F. B. Seibert*)

Acetone-soluble Fat of Cell Residues from the Preparation of Tuberculin.—The acetone-soluble fat isolated from tubercle bacilli residues from the preparation of PPD was found to be similar to that found in the tubercle bacillus, strain H37, and consisted of fatty acid esters of the disaccharide trehalose. Among the cleavage products liberated on saponification were the pigment phthiocol and anisic acid. The liquid saturated fatty acids contained, in addition to tuberculostearic acid and phthioic acid, several other higher liquid saturated fatty acids.—*The Chemistry of the Lipids of Tubercle Bacilli. LXIX. The Composition of the Acetone-Soluble Fat of Cell Residues from the Preparation of Tuberculin, C. O. Edens, M. M. Creighton & R. J. Anderson, J. Biol. Chem., August, 1944, 154: 587.*—(*F. B. Seibert*)

BCG.—The author, in collaboration with Sayé in Barcelona, has studied the late results of vaccination from the viewpoint of allergy. Of 58 vaccinated children with active tuberculosis the majority had been exposed to massive infection during the first months of life at a time when the immunization was not yet complete. These cases were compared with 14 cases that had been vaccinated and had not suffered infection and they all were negative. The results seem to point out that extensive allergy in the vaccinated is a demonstration of a virulent infection. The author accepts the original suggestion of Calmette and concludes that the attenuated allergy obtained by vaccination should be maintained by revaccination since apparently the BCG is eliminated or destroyed in the organism in a time varying with the animal species and the absorbed doses.—*Estado actual de la vaccinacion antituberculosa de Calmette-Guérin, R. Shelton, Rev. de tuberc. d. Cuba, October–December, 1942, 6: 169.*—(*F. G. Kautz*)

Immunization with Vole Bacillus.—The vole bacillus was isolated in England from a meadow mouse by Wells in 1937. This bacillus is an apparently stable, slow growing waxy mycobacterium, which is more pleomorphic in tissue than the human and bovine bacillus, but cannot be distinguished from them by serological absorption of agglutinins. From it a tuberculin can be produced which gives allergic skin reactions in animals infected with mammalian tubercle bacilli. The vole acid-fast bacillus does not appear to be an attenuated bovine, human or avian bacillus, nor a form of the murine or human leprosy bacillus. Its distinguishing characteristics seem to be fixed. This particular organism is apparently a third fixed type mammalian tubercle bacillus in addition to the human and bovine types. In some respects it may be a "link" between tubercle and leprosy mycobacteria. The vole bacillus is highly pathogenic only for the vole (meadow mouse). In this animal it produces a slowly progressive disease with subcutaneous lesions paramount

—like those of rat leprosy in some respects. The vole bacillus causes localized lesions in cattle, hamsters, guinea pigs, rabbits and white rats without progressive systemic disease, unless overwhelming doses are used. It is innocuous to fowl. The rabbit is somewhat protected from bovine tuberculosis by vaccination with the vole bacillus. There are, as yet, no published accounts of its pathogenicity for monkey or man. Unpublished work indicates that progressive vole bacillus infection in monkey and man is improbable. As a matter of fact, 1 mg. (moist weight) of viable vole bacilli administered subcutaneously and intravenously in the human has given no evidence that it will produce progressive disease. On account of its close similarity to the human tubercle bacillus and its lack of virulence, the authors have been using the vole bacillus as an immunizing agent for guinea pigs against human tubercle bacilli. The present paper is a further report on the degree of immunity to virulent human tubercle bacilli in guinea pigs vaccinated with viable and heat-killed vole acid-fast bacilli. For comparison, a comparable group of guinea pigs vaccinated with BCG was studied. One hundred and fifty-seven guinea pigs of approximately the same age and weight were divided into four groups. Group I (43 animals) were vaccinated subcutaneously with 4 mg. (moist weight) of the virulent vole strain D-15 seven weeks before infection and with 1 mg. of D-15 three weeks before infection. Group II (41 animals) were treated exactly like those of group I except that heat-killed vole bacilli were used. The vole bacilli were heated to 65°C. for thirty minutes. Group III (41 animals) received BCG as the immunizing agent and were given 10 mg. (moist weight) seven weeks before infection and this dose was repeated three weeks before infection. Group IV (32 animals) constituted the control group. As the infecting dose, each animal received subcutaneously 0.000,001 mg. virulent human tubercle bacilli or approximately 1,000 organisms of which 100 were assumed to be viable. This small dose used as immunity in tuberculosis may be overridden with heavy inocula of virulent bacilli. In groups I and II ulceration occurred at the vaccination site with a discharge of heavy creamy pus. Some of these ulcerations were healed at the end of seven weeks. The BCG animals (group III) showed ulceration and discharge of pus similar to those receiving viable bacilli, but with a more rapid tendency to heal. Fourteen months after infection the experiment was terminated. The results of the infection were as follows: (*1*) All controls alive after four months developed generalized tuberculosis. At nine months 78 per cent, and at fourteen months 88 per cent had died with generalized tuberculosis. (*2*) Of the heat-killed vole vaccinated animals, at nine months 35 per cent had died with generalized tuberculosis, at fourteen months 40 per cent. However, 48 per cent showed no gross tuberculosis at necropsy. (*3*) Of the virulent vole and BCG animals, for the same periods the numbers were roughly 10 per cent and 18 per cent. It is to be noted that at fourteen months 71 per cent of all the viable vole and 50 per cent of all BCG animals were free of gross tuberculosis at the time of death. From the study of microscopic sections it was not possible to say that any difference in protective power existed between the BCG and the viable vole vaccines. There was no significant difference in sensitivity to intracutaneous OT between the vaccinated groups during the period before infection. After infection, in general the greatest tuberculin sensitivity accompanied the greatest degree of infection. The control animals developed the highest degree of sensitivity. No significant differences in tuberculin sensitivity existed between the viable vole and the BCG groups at any stage of the experiment. The heat-killed vole vaccinated animals were somewhat less sensitive than the controls but more sensitive than the others. *Conclusions:* (*1*) Vaccination with living vole acid-fast bacilli significantly delayed the onset and diminished the severity of experimental tuberculosis in guinea pigs. (*2*) In the experiment the viable vole bacillus was as

effective as BCG against infection with virulent human tubercle bacilli. There is evidence to suggest that it may be superior to BCG. (3) A heat-killed vole bacillus vaccine showed a less, but still significant, degree of immunizing power. (With 3 plates.)—*Immunization with the Vole Acid-Fast Bacillus against Experimental Tuberculosis, W. S. Brooke & R. Day, Bull. Johns Hopkins Hosp., May, 1944, 74: 275.*—(*J. S. Woolley*)

Saprophytic Acid-fast Bacilli and Paraffin Oil in Immunization.—A lanolin-like substance and paraffin oil when combined with horse serum enhanced the formation of antibodies but had little if any effect on sensitization to horse serum. When killed timothy or tubercle bacilli were added to this mixture, both antibody formation and sensitization occurred. Killed timothy bacilli sensitized to tuberculin.—*Saprophytic Acid-fast Bacilli and Paraffin Oil as Adjuvants in Immunization, J. Freund & Annabel W. Walter, Proc. Soc. Exper. Biol. & Med., May, 1944, 56: 47.*—(*F. B. Seibert*)

Tuberculo-bacillary Allergy.—The authors assume, from previous experiments, that "tuberculosis has been resolved into the specific disease, which is closely involved with a developed specific immunity, and a phenomenon also produced by tubercle bacilli in the body, which is the existence of a specific tuberculo-bacillary allergy elicited and produced by the bacillary bodies." In experimental animals the tuberculous bacillary allergy has been differentiated from tuberculin hypersensitiveness. Tuberculin desensitization abolished the local effect of tuberculin but it did not abolish the "accentuated specific allergic-bacillary hypersensitiveness." An attempt was made to accomplish this by the injection of bacillary bodies into "tuberculo-bacillary allergic hypersensitive" guinea pigs. Repeated intravenous injections of viable avirulent human tubercle bacilli resulted in no appreciable reduction of hypersensitiveness to tuberculin or to viable bacillary bodies but rather in an accentuation of the allergic hypersensitiveness. Likewise, repeated subcutaneous injections of heat-killed tubercle bacilli in mineral oil resulted in only a slight accentuation of the allergic hypersensitiveness. Dead (heat-killed) tubercle bacilli suspended in saline and subcutaneously injected repeatedly showed no appreciable effect upon the tuberculo-bacillary allergic hypersensitiveness. However, when injected intravenously, a depression of the cutaneous allergic hypersensitiveness to tuberculin and bacillary bodies occurred. This could not be attributed to a desensitizing effect but rather was believed to be caused by the effects of the intravenous injection of the bacilli on the general vascular or inflammatory response of the animals. Dead avirulent human tubercle bacilli repeatedly injected intravenously into guinea pigs revealed no appreciable effect on the development of the tuberculous disease resulting from subcutaneous infection with highly virulent human tubercle bacilli; but these same injections appeared to exert a slight detrimental effect on the specific immunity, resulting from vaccination with viable avirulent human tubercle bacilli, which may be accounted for by the ability of the dead bacillary bodies to produce tubercles. "Hypersensitivity" was achieved in the test guinea pigs by injecting a large dose of avirulent human tubercle bacilli one month before the small infecting dose of virulent human bacilli. [In this article clarity has been sacrificed for brevity.]—*An Attempt to Desensitize against Tuberculo-Bacillary Allergy, H. J. Corper & M. L. Cohn, Am. J. Clin. Path., June, 1944, 14: 344.*—(*J. S. Woolley*)

Allergy.—The reaction to an intracutaneous injection of an allergenic substance is accompanied by an increase of the local insensible transpiration. This increase is proportionate to the extent of the reacting skin surface. Carefully measured and weighted containers were applied over the site of injection of allergenic substances and the amount of perspiration accumulated was compared to that obtained with an identical procedure over the homologous controlateral part where no injec-

tion was given. Over the site of injection the amount of perspiration was considerably increased. This method enables one to express in figures the state of reactivity of the individual.—*Determinazioni allergometriche col metodo della traspirazione latente, C. Bazzicalupo & A. Iaccarino, Riv. di tisiol., 1942, 15: 201.*—(*G. Simmons*)

Petragnani's Anatuberculin.—Patch tests and intracutaneous tests with Petragnani's anatuberculin were made in 138 patients with various forms of tuberculosis and in other diseases. The intracutaneous test was positive in 81 cases, 52 of which had shown a positive patch test also. The cases were thus subdivided: 22 cases of pleurisy with effusion, of which 4 showed complete anergy; 34 cases of active tuberculosis, mainly productive forms; in 8 the patch test was negative, whereas the intracutaneous test was positive; 21 cases of rheumatic fever, only 4 had negative tests; 6 influenza cases, 5 negative; 10 malignant neoplasms, 9 negative; 15 typhoid fever, 4 negative. The remaining 30 cases had various diseases, except tuberculosis, and 45 per cent of them showed an allergic response to anatuberculin.—*L'allergia tubercolare studiata merce l'intradermo e la cutireazione con anatubercolina Petragnani in diversi stati morbosi, M. Pellegrini & N. Carinci, Riv. di pat. e clin. d. tuberc., 1939, 13: 487.*—(*G. Simmons*)

Vaccination with Anatuberculin.—One hundred and seventeen children, most of whom had a positive Mantoux test, were vaccinated with Petragnani's anatuberculin (human tubercle bacilli recently killed, treated with formaldehyde, 1 per cent, neutralized with ammonium hydroxide). This substance is said to be less toxic than ordinary tuberculin and to be able to induce an allergic state of long duration. The children treated were divided into 2 groups: (*1*) Children with positive anamnestic data and positive Mantoux test. Following the injection of 0.1 cc. of anatuberculin there were slight systemic reactions and a constant local ulceration, which healed within two or three months. No focal reaction could be seen radiologically. In cases with preëxisting activity of the lesions some improvement was noted. (*2*) Children with a negative Mantoux test. The initial dose of anatuberculin was 0.1 cc. and this was followed by 0.25 cc. after fifteen days. Moderate systemic reactions, intense local but no focal reactions were observed. Following the second injection a strong allergy, as evidenced by a strongly positive Mantoux test, was established. On the basis of these observations the author concludes that the anatuberculin prepared by Petragnani is a safe substance to be used for diagnostic as well as therapeutic purposes and considers it to be superior to other tuberculins.—*La vaccinazione con l'anatubercolina integrake di Petragnani del bambino allergico con particolare riguardo alla reazione di focolaio, G. Colale, Riv. di pat. e clin. d. tuberc., 1940, 14: 442.*—(*G. Simmons*)

New Tuberculin Test.—For routine testing of school children, the percutaneous method is most desirable. Although Moro's method gives fairly good results, the method has been improved upon by Mérieux of Lyon. He uses cultures of two bovine and two human strains of tubercle bacilli, adds formalin in the proportion 3:1, and reduces the mixture to one-sixtieth of its former volume at a temperature of 37°C. The resultant syrupy fluid is very stable and may be kept for years. A drop of 2 mm. in diameter is applied to a suitably cleansed skin area. Comparing this method with Moro's ointment, 7.4 per cent more positive cases were discovered among a series of 1,100 children tested. The method has not as yet been compared in efficacy to the Mantoux test.—*Das Neo-Tuberkulin Mérieux und seine Anwendung bei Reihen-Untersuchungen, E. Braun, Schweiz. med. Wchnschr., April 8, 1944, 74: 364.*—(*H. Marcus*)

Transcutaneous and Intracutaneous Tuberculin Tests.—A comparison of the transcutaneous and intracutaneous tests was made on 103 patients: 64 tuberculous and 39 non-

tuberculous. To eliminate marked variation in the response to different commercial tuberculins, the autolytic tuberculin and a purified protein tuberculin were prepared from the same original cultures. Among the 103 patients tested, 90 (87 per cent) were positive by the transcutaneous test, and 89 (86 per cent) by the intracutaneous injection. Agreement between the two tests occurred in 82 of the positive tests. When considering the 64 definitely tuberculous cases tested, the agreement was 58 (90 per cent) for the transcutaneous and 62 (96 per cent) for the intracutaneous tests. The slight differences were attributable to the transcutaneous absorption retardation in the definitely ill cases. Among the 39 nontuberculous cases (including those with possible infection but no evident tuberculous disease), the agreement again was fairly close; 32 (82 per cent) reacted to the transcutaneous test as compared with 27 (70 per cent) for the intracutaneous test. There were 7 cases which gave a positive transcutaneous test and a negative intracutaneous test (all grades reaction to 0.001 mg.) and 2 of the latter were positive to the 0.005 mg. test. There were 7 cases which gave a positive (all grades) intracutaneous test and a negative transcutaneous test. The foregoing disagreement in findings brings out several important points with regard to tuberculin tests. Even though highly specific, (*1*) these tuberculin tests are conditioned by a number of important factors not always controllable no matter which type of test is used; and (*2*) the importance of repeating a test easily if necessity demands. For this purpose, the transcutaneous test possesses many advantages over any injection test. However, it must be admitted that an intracutaneous test is warranted as a verification test at times, but the transcutaneous test appears to be preferable as a routine either for diagnosis or surveys. The tuberculin test ranks among the best biological diagnostic tests, not as an exclusive test but rather as an inclusive one in addition to other verifying medical findings. It is valuable in specific surveys and as a diagnostic aid in tuberculosis and for the presence of the hypersensitivity of tuberculous allergy.—*Comparative Results with Transdermal (or Transcutaneous) and Intracutaneous Tuberculin Tests, H. J. Corper, J. Lab. & Clin. Med., April, 1944, 29: 398.*—(*F. G. Petrik*)

Patch Test.—The author analyzed the results of the Vollmer patch test in 487 children aged from two to sixteen years. These children represented 88 per cent of all children born to permanent residents in the town of St. Andrews. There were 340 (69 per cent) negative and 151 (31 per cent) positive results in 491 examinations. Four children were reëxamined either because of tuberculosis developing in the family or because of symptoms suggestive of tuberculosis. All 4 had been negative on first examination—3 of them became positive. A breakdown into age groups revealed that 21 per cent of the 0 to five years group, 32 per cent of the six to ten years group and 45 per cent of the over ten years group were positive. An X-ray examination of the chest was made in 131 of the reactors. Five (3.8 per cent) revealed tuberculous lesions of the lungs or pleura, 14 (10.7 per cent) required further observation, 1 (0.8 per cent) revealed a calcified primary focus, 8 (6.1 per cent) showed enlarged hilar nodes, 41 (31.3 per cent) had calcified nodes and in 62 (47.3 per cent) the radiogram was within normal limits. Sixteen negative reactors were also X-rayed. One showed calcified nodes, 2 had enlarged hilar nodes, and the remaining 13 were within normal limits. An analysis as to housing conditions and incidence of reactors failed to reveal any significant differences. One of the children examined was proved bacteriologically to have a bovine infection of lung and kidney, and she was a negative reactor.—*Patch Testing in an East Coast Town, E. J. Simpson, Brit. M. J., February 26, 1944, 1: 286.*—(*D. H. Cohen*)

Prevention of Tuberculosis by Ultraviolet Irradiation.—There is much evidence that human pulmonary tuberculosis is acquired by

the inhalation of minute particles or droplets carrying tubercle bacilli. In a closed space (room) the microörganisms are uniformly distributed throughout the air as proximity to tuberculous guinea pigs shedding tubercle bacilli is not essential for the infection of roommates. Since exposure to ultraviolet radiation kills pure cultures of tubercle bacilli suspended in the air, an attempt was made to determine whether natural airborne contagion of tuberculosis can be prevented by these means. The test animals were from certain inbred rabbit families, frequently described by the author, among which the A family is genetically and uniformly highly resistant to tuberculosis and the C and F families genetically and uniformly show low resistance to the infection. In the study here reported, these three families were used, first, to equalize the natural resistance of the experimental and control animals and, second, to determine whether ultraviolet radiation will have a greater protective influence on the animals of high resistance as compared with those of low resistance. Normal rabbits from the three families mentioned (A, high resistant and C and F, low resistant) were exposed to air-borne contagion from a steady group of rabbits artificially infected with virulent tubercle bacilli and whose cages were only separated from the noninfected rabbits by a space of 6 inches. An air-tight metal partition divided this space (and later the room) transversely at the centre so that one-half of it could be irradiated (ultraviolet lamps), the other part serving as the control or nonirradiated part. To equalize the intensity of irradiation (some cages were nearer the lamps than others) of the air breathed by the contacts, the cages housing them were constantly rotated in an orderly succession. The contacts in the unirradiated half of the cage were also rotated in a similar manner. With some variations, this was the general set-up. The bacilli voided by the infected rabbits are the chief source of the contagion, depending on the bedding used. The results from these experiments were clear-cut and demonstrate the protective influence of ultraviolet irradiation of the air against natural air-borne contagion of tuberculosis in rabbits. Even when the radiant energy was low it reduced considerably the incidence of tuberculosis, for it completely protected rabbits of high natural resistance from acquiring demonstrable disease, although some of them became tuberculin sensitive It failed to protect a small proportion of rabbits of low natural resistance from fatal tuberculosis. When the radiant energy was of high intensity, all rabbits, whether of high or of low natural resistance, were almost completely protected from a contagion so severe that it was fatal to the great majority of rabbits of the same genetic constitution not protected by these rays. The contagion of tuberculosis in these studies is air-borne and the radiant energy exercises its protective influence by its bactericidal properties. It is probable that ultraviolet irradiation would control air-borne contagion of human tuberculosis.—*Experimental Epidemiology of Tuberculosis: The Prevention of Natural Air-Borne Contagion of Tuberculosis in Rabbits by Ultraviolet Irradiation, M. B. Lurie, J. Exper. Med., June, 1944, 77: 559.—(J. S. Woolley)*

Experimental Epidemiology of Tuberculosis.—In a study of certain inbred rabbit families it became increasingly clear that, if these rabbits were exposed to natural contagion, there was frequently a marked discrepancy between the rapidity with which they acquired tuberculosis on the one hand and the duration of the ensuing disease on the other. The present report deals with these two phases of resistance in the family A, of high inherited resistance to tuberculosis, and the families C and F, of low inherited resistance to the disease. The effect of various concentrations of the contagious agent on these families is also considered. The data analyzed in the paper have been obtained in the course of the past ten years of study of the inherited natural resistance to tuberculosis in these families of rabbits. All were normal rabbits that were exposed to natural air-borne contagion of tuberculosis by living on one side of cages separated in the middle by a wire mesh screen.

On the other side of this screen were placed a certain number of rabbits artificially infected with virulent tubercle bacilli, usually by the intravenous route. Four or 8 infected rabbits served as sources of contagion for 5 or 10 contacts, respectively, depending on the size of the cage which varied in different experiments. The population of the artificially infected rabbits was maintained constant throughout the period of exposure by replacing the dying animals by similarly inoculated rabbits. The urine of these rabbits was examined for tubercle bacilli by direct smear or culture at different periods during the course of their disease. Every two to four weeks the contacts were tested with tuberculin. The onset of the disease in the contacts was dated from the time when the tuberculin reaction became definitely positive. Careful autopsy was performed at time of death. In one experiment, 8 rabbits of high resistance and 7 of low resistance were exposed as indicated and the preallergic and allergic periods, and the type of disease occurring, were noted. While it took an average of 2 months (0.9–3.6) for the members of the resistant A family to become tuberculin sensitive, this preallergic period averaged 4.7 months (1.3–8.3) for the low resistance rabbits. On the other hand, the duration of fatal tuberculosis in the A rabbits averaged 6.4 months (4.1–10.4) while the duration of the disease in the C and F rabbits averaged only 3.5 months (2.1–3.9). Thus, the rabbits of high resistance showed evidence of being infected quickly but died of a chronic, slowly progressive disease, while the members of the families of low resistance showed evidence of being infected slowly but died of a rapidly progressive disease. If we take the onset of allergy as evidence of the beginning of the disease, it is clear that the highly resistant animals are attacked by tuberculosis more quickly than the rabbits of low resistance, but they resist the progress of the ensuing disease more effectively than the latter. It may be questioned, however, whether the development of hypersensitivity to tuberculin is an accurate index of the time of the onset of the disease for occasional animals became allergic, but did not develop discoverable disease. Just how soon tuberculosis began in relation to this onset is, of course, a moot question; but there could not have been much of a delay for the character of the disease in each group, slowly progressive in the resistant and fulminating in the susceptible, fitted in well with the time allotted in the experiment. The author believes that the tuberculin test is a reliable indicator of the duration of the disease, which is all a question of what constitutes disease. In another series of experiments, members of these inbred families of rabbits were exposed to air-borne contagion of varying intensities as measured by the percentage of rabbits used as sources of contagion, which showed tubercle bacilli in the direct smear of the urine at death. One group of 7 resistant and a group of 11 low resistant were exposed to low intensity contagion. None of the former group acquired demonstrable lesions (4 became allergic) after an average exposure of fourteen months. Two of the latter group, with an exposure of six and eleven months respectively, developed rapidly progressive disseminating tuberculosis. Three others became allergic but showed no demonstrable disease. Another group of these families exposed to more severe contagion showed the following: In 6 highly resistant rabbits, 3 acquired a slowly progressive tuberculosis which was fatal in from ten to thirteen months. Five of the 6 became allergic. Of the 11 contacts of low resistance, 10 acquired tuberculosis and accompanying this increase in incidence there was also acceleration of attack (decrease in average preallergic period). In all instances the type of disease was rapidly progressive but did not differ materially from that of the disease in this group in the previous experiment. The final experiment concerns the exposure of these two groups of rabbits to contagion of high intensity. All 7 resistant animals became allergic and 5 of these developed manifest disease. All (5) susceptible animals developed rapidly progressive, disseminating disease. Among the resistant rabbits not only was the incidence of the disease increased but the rapidity of attack was further accelerated and the type of disease acquired fre-

quently partook of some of the qualities characteristic of the families of low resistance. The duration of the disease was also considerably reduced. By contrast the low resistance rabbits differed in no essential respect to this high concentration of tubercle bacilli as compared to their response to the medium concentration. *Conclusions:* (*1*) Hereditary resistance to attack by air-borne tubercle bacilli is distinct from the resistance to the ensuing disease. (*2*) One inbred rabbit family has little resistance to attack by the microorganism but has considerable resistance against the ensuing disease. (*3*) Another inbred family has considerable resistance against attack by the tubercle bacillus but has little resistance against the ensuing disease. (*4*) Increasing concentrations of tubercle bacilli in the environment of the family of high genetic resistance to the disease increase the incidence of infection, accelerate the onset of the disease, and affect its essential character in proportion to the concentration of the microörganism. (*5*) Up to a certain concentration of tubercle bacilli in the environment of the families of low genetic resistance to the disease, increasing concentrations of the infectious agent also increase the incidence of the disease and accelerate its onset, although its anatomical character is always of a uniform rapidly progressive type. Beyond this concentration further increment of the infectious agent exercises no effect.—*Experimental Epidemiology of Tuberculosis: Hereditary Resistance to Attack by Tuberculosis and to the Ensuing Disease and the Effect of the Concentration of Tubercle Bacilli upon these Two Phases of Resistance, M. B. Lurie, J. Exper. Med., June, 1944, 79: 573.*—(*J. S. Woolley*)

Chemotherapy in Experimental Tuberculosis.—Among the chemical agents found most effective in combating tuberculosis in experimental guinea pigs, derivatives of 4,4′-diaminodiphenylsulphone are best. The drug has little taste and can be mixed with the feed without impairing its palatability. It is absorbed slowly from the gastro-intestinal tract and persists longer in the blood stream than most sulphamides. A study was undertaken to determine its effect in experimental tuberculosis. Three experiments were run. In two the drug was started two days before inoculation of the guinea pigs with tubercle bacilli, and the experiments terminated sixty days later. In the third experiment, animals were inoculated with tubercle bacilli, and treatment was started six weeks later. In all animals the virulent variant of H37, H37RV, was used. The daily dose of the drug was 150 mg. mixed with the feed. In the first two experiments 3 treated animals died, and the cause of death was not apparent but was assumed to be due to the toxic effect of the drug. When the third experiment was terminated 228 days after inoculation, 71.4 per cent of the untreated animals had died from sufficient tuberculosis to cause death, and 71.4 per cent of treated animals were living. Of the 4 dying in the latter group, one died from tuberculosis while in the other 3 the cause of death was not apparent, though each animal had minimal disease only. The relative amounts of tuberculosis present in treated and untreated groups, evaluated numerically, showed a marked difference in the character and amount of the disease. In the first two experiments, the average index of infection among the treated animals was 12.1 and 14.1 as compared to 76.4 and 71.4 in the two untreated groups. If the site of inoculation is disregarded, the indexes would be 66.4 for the untreated and 7.9 for the treated in group II. In the long-term experiment the difference is even more striking, the index of infection averaging 84.1 in the untreated animals and 8.4 in the treated. Of importance also is the fact that in 6 of the 13 treated guinea pigs tuberculous lesions were absent in liver, spleen and lungs, grossly and microscopically, as compared to one in 28 in the untreated group. The pathological changes are even more interesting. In the first two experiments the aggressive character of the disease in the untreated controls was in sharp contrast to the focal and relatively few and small lesion in the treated group. Necrosis, when present, was minimal in amount. The changes that occurred in both groups of experiment three was even more dramatic.

The character of disease in the untreated animals was that of an apparently uninhibited process occupying most, if not all of the organs of predeliction. Necrobiosis was a constant and striking feature so that, in some, the histological landmarks were obliterated. Among the treated animals in this group, there were a relatively few nonprogressive residual lesions found in the organs of predilection. A tendency of the axillary lymph node lesions to calcify was noted, and only a few nodules and hard tubercles were found in the spleen and lung. Sensitivity to tuberculin was greater in the untreated than in the treated, and among the latter group those with indefinite or negative tests showed nonprogressive or no demonstrable lesions. Attempts were made to culture tubercle bacilli from the spleens. In experiments one and two, 12 cultures were positive out of 14 in the untreated group and one in 13 of the treated group of experiment one, while in the second group, 9 in 10 of the untreated and 2 in 7 of the treated were positive. Thus, from 24 untreated animals 21 cultures were positive, while from the 20 treated ones, 3 were positive. No attempt was made to obtain detailed information regarding the blood, but cardiac blood was obtained at the termination of the experiment in 8 animals of the control group, and 6 of those treated for one hundred and eighty-six days. Examinations revealed that definite destruction of erythrocytes was caused by the drug, but there was a marked degree of macrocytosis indicating rapid regeneration. There was also a high per cent (10.3 per cent) of reticulocytes in the treated group.—*The Effects on Experimental Tuberculosis of 4,4'-diaminodiphenylsulphone, W. H. Feldman, H. C. Hinshaw & H. E. Moses, Am. J. M. Sc., March, 1944, 207: 290.*—(*G. F. Mitchell*)

Diet and Toxicity of Promin.—Promin has been shown to be an effective chemotherapeutic agent in the control of *experimental* tuberculosis. Since the drug does induce certain toxic reactions in the experimental animal, any measures which may reduce the extent of these reactions without minimizing the therapeutic value of the drug, may prove to be of clinical importance. Self-selection experiments have shown that young rats given promin daily appeared to crave some of the fractions of vitamin B. Also, recent studies have shown that foods high in their vitamin B content may modify or even nullify the toxic influences of some of the sulfone drugs. A study of feeding purified diets, and purified diets fortified by whole liver or brewers' yeast, to white rats receiving 50 mg. of promin daily is reported. The following conclusions are reached: Animals which ate the purified high protein diet gained more weight during the time promin was given than those which ate the purified high carbohydrate diet. Animals which ate the high carbohydrate diet supplemented by whole liver gained nearly four times as much as those eating the high carbohydrate diet alone, during the time promin was given. Animals which ate the purified high protein diet supplemented by brewers' yeast gained twice as much as those eating the high protein diet alone, during the time promin was given. The administration of liver extract (Campolon) was accompanied by a marked decrease of weight during the first week of administration of promin. Liver extract was far less effective than whole liver. Loss of hair and hyperirritability occurred in both groups eating either the purified high protein or the high carbohydrate diet. These symptoms did not occur when the drug was given to animals eating the diet plus whole liver. Rather extensive alopecia developed in animals given the liver extract. The concentration of promin in the blood of all animals examined the day following the last administration of promin was highest in those which received the liver extract. It was lowest in those which ate the diet containing the whole liver supplement. The most marked anemia occurred in animals which ate the purified high carbohydrate diet. Slightly better values were obtained in rats which ate the high protein diet. The supplementation of the diets by either whole liver or yeast greatly improved the blood picture.—*The Influence of Purified Diets upon the Toxicity of Promin, G. M. Higgins, Am. J. Clin. Path., May, 1944, 14: 278.*—(*J. S. Woolley*)